Small Business Innovation Research/Small Business Tech Transfer

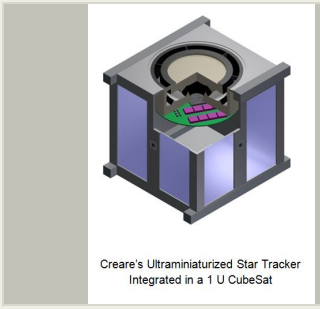
Ultra-Miniaturized Star Tracker for Small Satellite Attitude Control, Phase II

Completed Technology Project (2014 - 2016)

Project Introduction

Creare and Embry-Riddle Aeronautical University (ERAU) propose to complete the design, development, and testing of an ultra compact star tracker specifically intended for small satellites such as the CubeSat platform. Our design is based on proprietary "folded optics" technology previously developed by ERAU for use in military and commercial optical applications that require a compact footprint and high performance. Furthermore, the design utilizes recent advances in high pixel count CMOS imaging sensor technology. The folded optics design is superior to conventional refractive optics in miniature star trackers because (1) the compact footprint is achieved without sacrificing accuracy; (2) the light-gathering aperture is much greater, leading to better sensitivity; (3) the aperture geometry makes the shielding baffles smaller; and (4) the imaging sensor can be shielded efficiently from cosmic radiation. During the Phase I project, we demonstrated a pointing accuracy of the order of 1 arc second testing a brassboard model of our design. We furthermore completed the design, performed analysis to determine the optimal design parameters, and confirmed the brassboard sensitivity and resolution. In Phase II, we will fabricate the optimized design, test the prototype in the laboratory and in the field, and deliver the prototype to NASA so that NASA can fly the prototype on a NASA high-altitude balloon mission.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Embry-Riddle Aeronautical University-Daytona Beach	Supporting Organization	Academia	Daytona Beach, Florida
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Florida	Maryland
New Hampshire	

Project Transitions

September 2014: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137522)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

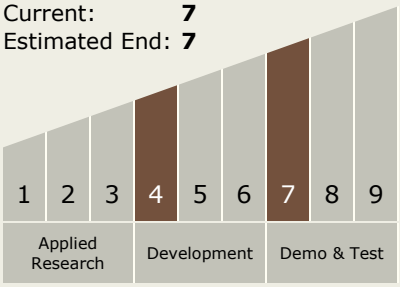
Carlos Torrez

Principal Investigator:

Robert K Schoder

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



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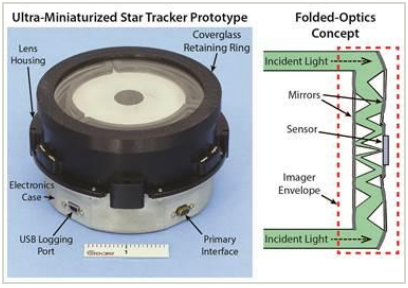
Images

Briefing Chart Image
Ultra-Miniaturized Star Tracker for Small Satellite Attitude Control, Phase II
(https://techport.nasa.gov/image/133258)



Final Summary Chart Image
Ultra-Miniaturized Star Tracker for Small Satellite Attitude Control, Phase II Project Image
(https://techport.nasa.gov/image/127954)

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.3 Navigation Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System